Claims

1. A method of forming a field effect transistor, the method comprising:

forming a channel heterojunction field effect transistor having a top surface; and

applying AlN to the top surface of the heterojunction channel field effect transistor.

2. The method of claim 1 wherein the thickness of the AlN layer is between approximately 500 and 2000 Angstrom.

3. The method of claim 1 wherein Al and N are applied alternately until a desired thickness of AlN is obtained.

4. The method of claim 1 wherein a predetermined amount of time occurs between each alternate application.

5. A method of forming a field effect transistor, the method comprising:

forming a heterojunction channel field effect transistor having a top surface; and

applying AlN to the top surface of the heterojunction channel field effect transistor using molecular beam epitaxy.

6. The method of claim 5 wherein the beams are alternately applied for approximately two seconds until the desired thickness is obtained.

7. The method of claim 5 and further comprising delaying a predermined amount of time between the alternating beams.

8. The method of claim 7 wherein the beams are alternately applied for approximately two seconds, and the delay is also approximately two seconds between the alternating beams until the desired thickness is obtained.

9. The method of claim 5 wherein the desired thickness is approximately 500 Angstrom.

10. The method of claim 5 wherein the beams are applied at approximately 150 degrees Celsius.

11. A method of forming a layer of AlN of desired thickness on a semiconductor substrate, the method comprising:

using molecular beam epitaxy:

applying beams of Al; and

applying beams of remote plasma RF nitrogen alternately with the beams of AL to produce the layer of AlN of desired thickness.

12. The method of claim 11 wherein the beams are alternately applied for approximately two seconds until the desired thickness is obtained.

13. The method of claim 11 and further comprising delaying a predermined amount of time between the alternating beams.

14. The method of claim 13 wherein the beams are alternately applied for approximately two seconds, and the delay is also approximately two seconds between the alternating beams until the desired thickness is obtained.

15. The method of claim 11 wherein the desired thickness is approximately 500 Angstrom.

16. The method of claim 11 wherein the beams are applied at approximately 150 degrees Celsius.

17. A method of forming a layer of AlN of desired thickness on a semiconductor substrate, the method comprising:

using molecular beam epitaxy at a temperature less than approximately 300 degrees Celsius:

applying a beam of Al;

waiting a predetermined period;

applying a beam of remote plasma RF nitrogen;

waiting a predetermined period; and

repeating application of the beams and waiting periods to produce the layer of AlN of desired thickness.

18. The method of claim 40 wherein the desired thickness of AlN is approximately 500 Angstrom.

19. The method of claim 40 wherein the beams last approximately two seconds each application, and the waiting periods are approximately two seconds.

20. A heterojunction channel field effect transistor comprising:

a drain;

a source;

a gate; and

a conformal AlN layer formed over the drain, source and gate.

21. The heterojunction channel field effect transistor of claim 20 wherein the AlN layer is formed using molecular beam epitaxy.

22. The heterojunction channel field effect transistor of claim 20 wherein beams of Al and N are alternately applied for approximately two seconds until the desired thickness is obtained.

23. The heterojunction channel field effect transistor of claim 22 and further comprising delaying a predermined amount of time between the alternating beams.

24. The heterojunction channel field effect transistor of claim 20 wherein the thickness of the AlN layer is between approximately 500 and 2000 Angstrom.

25. The heterojunction channel field effect transistor of claim 20 wherein the AlN layer is formed by sputtering.

26. A heterojunction channel field effect transistor comprising:

a barrier layer;

a drain formed in the barrier layer;

a source formed in the barrier layer;

a gate disposed on the barrier layer between the source and drain;

drain and source contacts exposed on the barrier layer; and

a conformal AlN layer formed between the drain and source contacts.

27. The heterojunction channel field effect transistor of claim 25 wherein the AlN layer is formed using molecular beam epitaxy.

28. The heterojunction channel field effect transistor of claim 25 wherein beams of Al and N are alternately applied for approximately two seconds until the desired thickness is obtained.

29. The heterojunction channel field effect transistor of claim 27 and further comprising delaying a predermined amount of time between the alternating beams.

30. The heterojunction channel field effect transistor of claim 25 wherein the thickness of the AlN layer is between approximately 500 and 2000 Angstrom.